Thermochemical Processing

DOE OBP Thermochemical Platform Review Meeting
June 7-8, 2005

Chair: Don Stevens, PNNL

Presentation Outline

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- **Session Agenda**
- **Strategic Fit of Projects in Session**
  - **TC Area fit**
  - **Stage gate fit**
  - **Pathways fit**
  - **Milestone fit**
- **Technical Barriers Addressed**
- **Customers**
- **Budget Summary**

Session Agenda

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Session : Themrmochemical Processing Chair: Don Stevens (PNNL)	
10:50	Overview – D. Stevens, PNNL
11:10	Feed Processing and Handling – S. Kelley, NREL
11:40	Gasification of Biorefinery Residues – D. Dayton, NREL
12:10	Lunch – on your own
1:10	Wet Gasification of Biorefinery Residues -- D. Elliott, PNNL
1:40	Process Monitoring Tools – V. Bush, GTI
2:00	Thermochemical Conversion of Corn Stover -- J. Gaddy, Bioeng. Res.
2:30	Catalytic Hydrothermal Gasification -- E. Gray, Antares
3:00	Break
3:20	Gasification for Fuels/Chemicals in a Pulp Mill – R.Katofsky, Navigant
3:50	High Temp. Black Liquor Gasification – Weyerhaeuser
4:20	Pressurized Entrained Flow BLG – K. Witty, Univ. Utah
4:50	Review Panel Convenes to Evaluate Day 1

Thermochemical Platform

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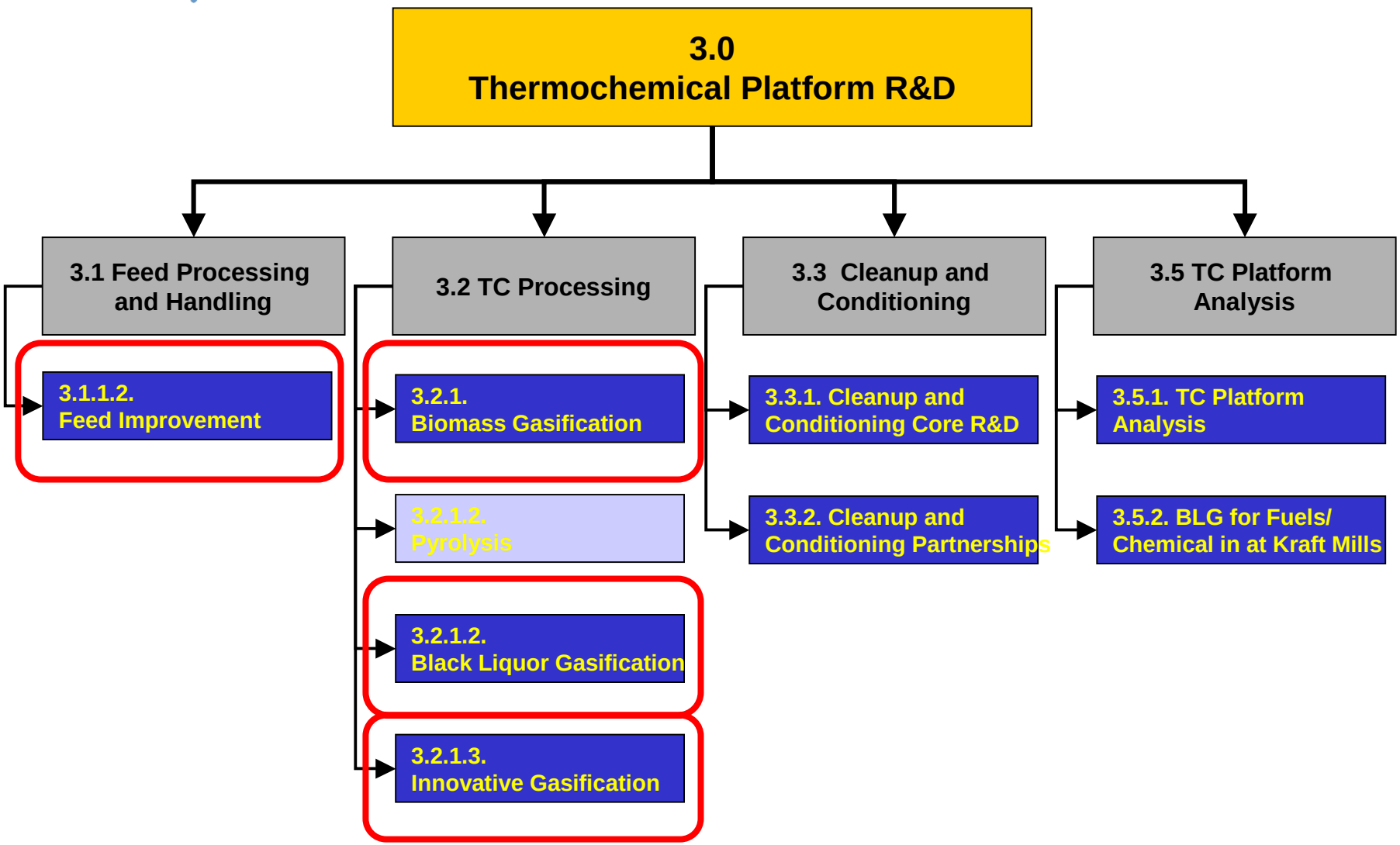

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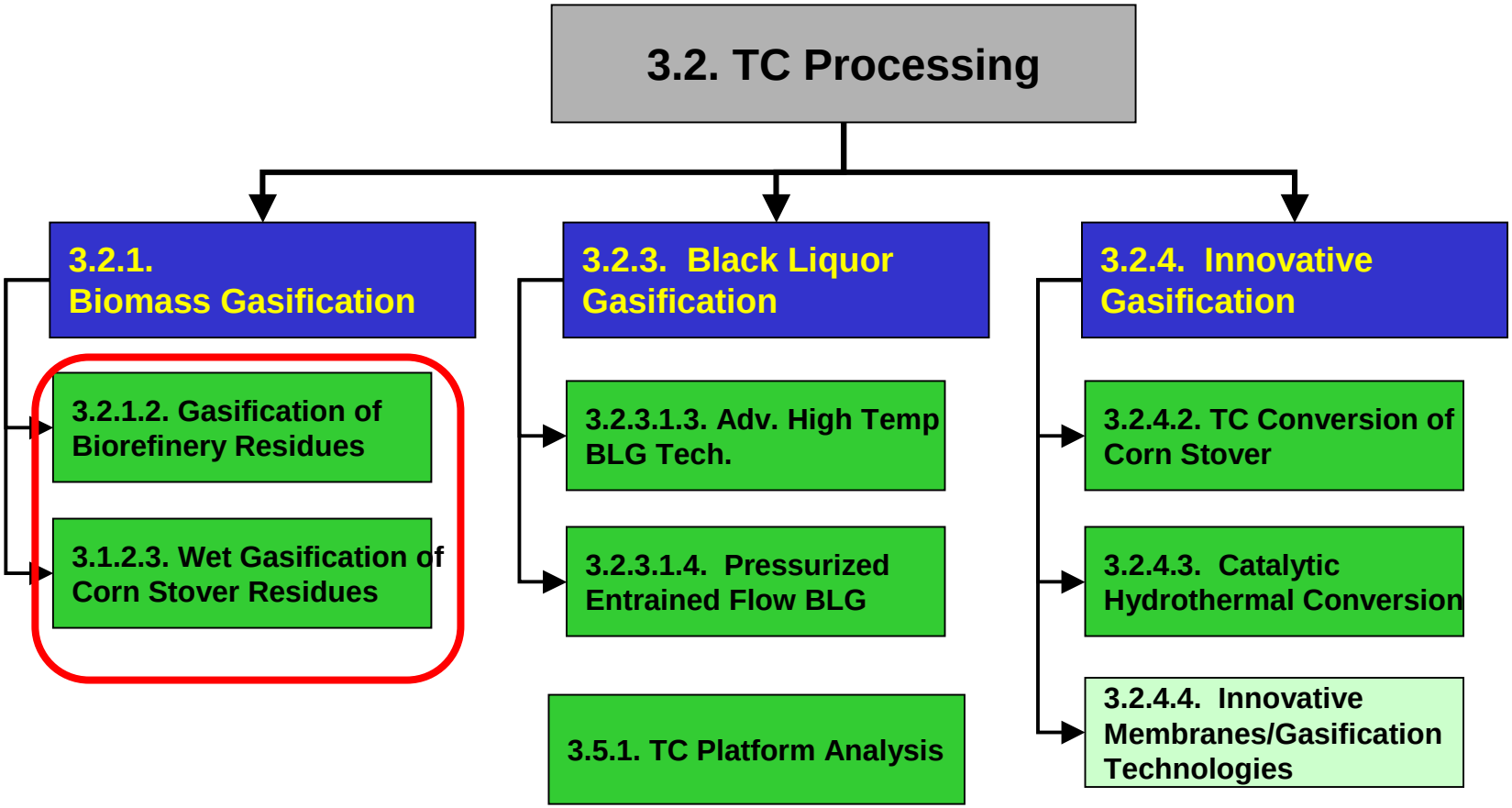

Thermochemical Platform

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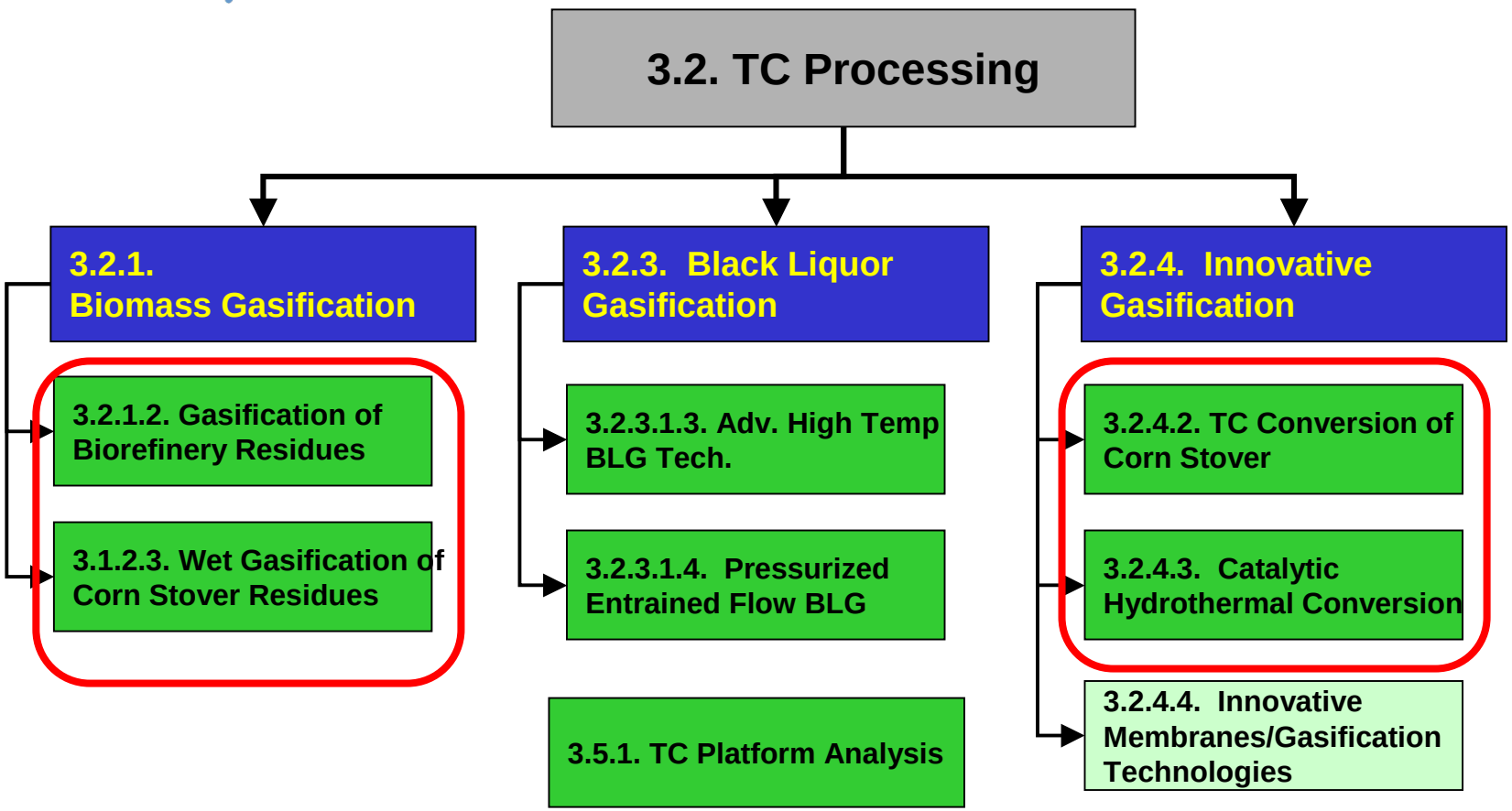

Thermochemical Platform

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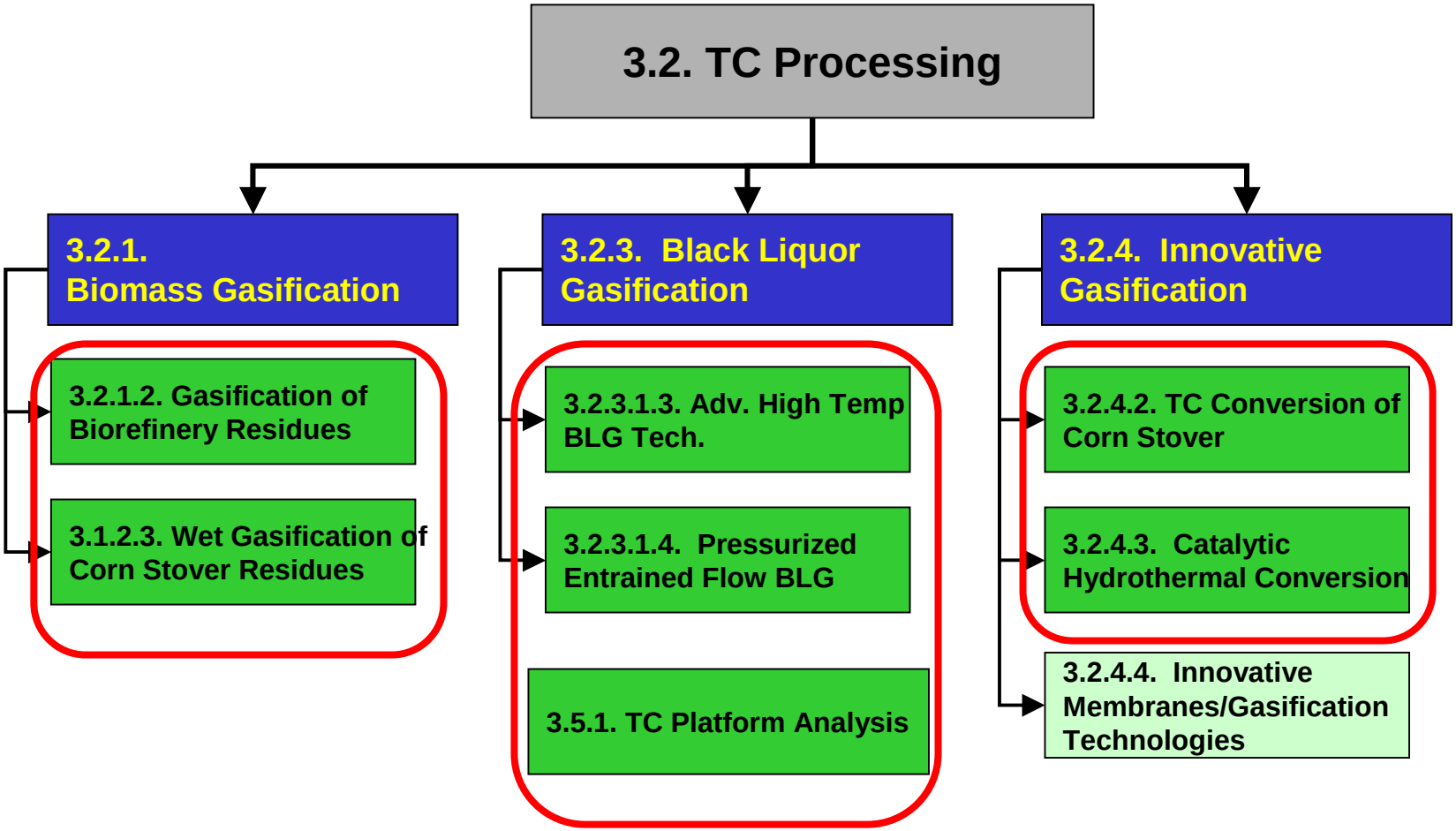

Stage Gate Fit

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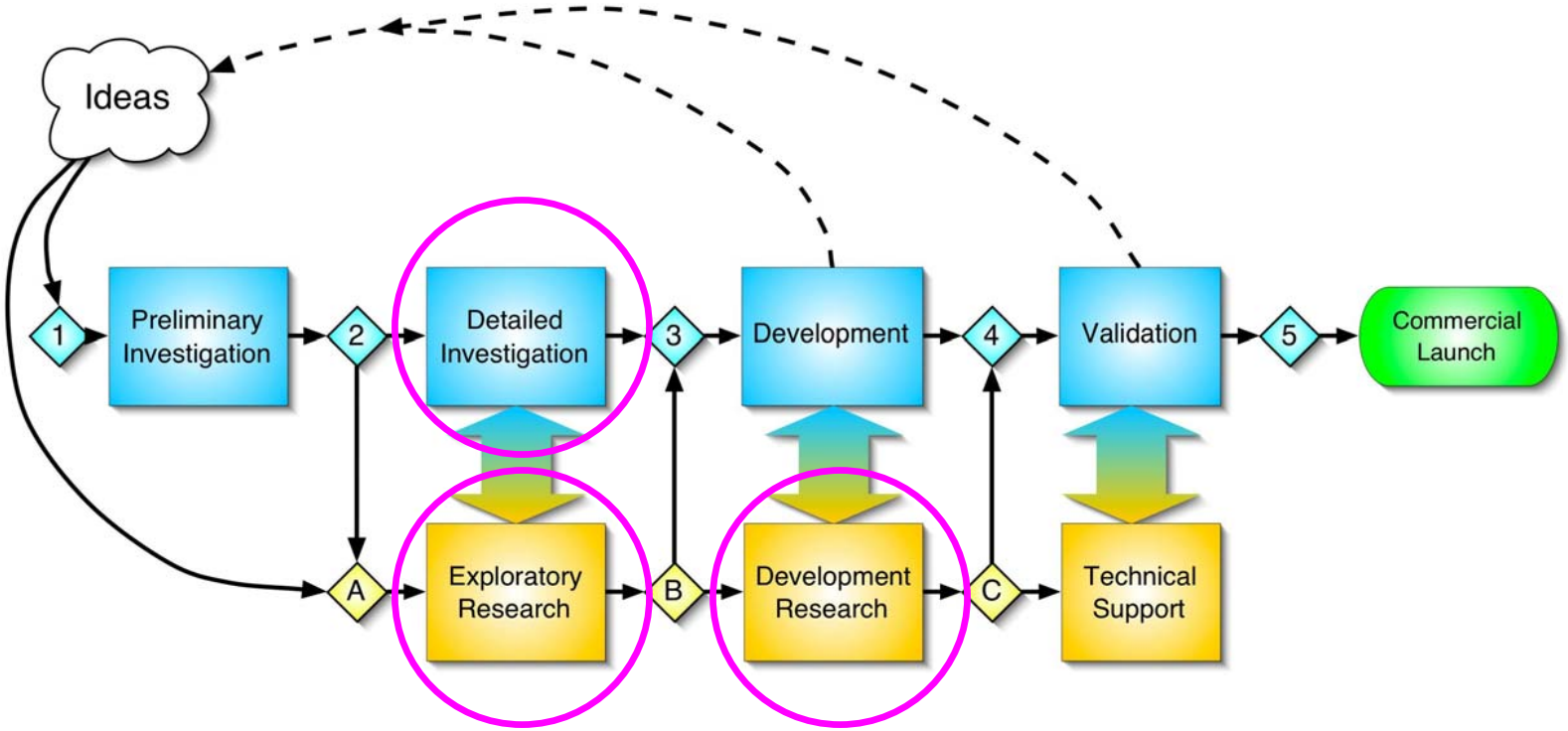
What Stage is the project in?



Stage Gate Fit

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Project	Stage
Feed Processing and Handling (NREL)	RT Stage A, Exploratory Research
Gasification of Biorefinery Residues (NREL)	RT Stage A, Exploratory Research
Wet Gasification of Biorefinery Residues (PNNL)	RT Stage A, Exploratory Research
Process Monitoring Tools (GTI)	CT, Stage 2. Detailed Evaluation
Thermochemical Conversion of Corn Stover (Bioeng. Res.)	CT, Stage 2. Detailed Evaluation
Gasification for Fuels/Chemicals in a Pulp Mill (Navigant)	CT, Stage 2. Detailed Evaluation
High Temp. Black Liquor Gasification (Weyerhaeuser)	CT, Stage 2. Detailed Evaluation
Pressurized Entrained Flow BLG (Univ. of Utah)	RT Stage B, Development Research

Program Focus:

- Current program includes:
  - Thermal gasification using oxygen-blown or indirectly heated gasifiers for medium-energy syngas
  - Hydrothermal gasification for medium-energy syngas
  - Focus on gases suitable, with conditioning, for liquid fuels production

- Not currently included:
  - Air-blown gasification for low-energy fuel gas
  - Pyrolysis to produce biocrude

Technical Barrier Areas

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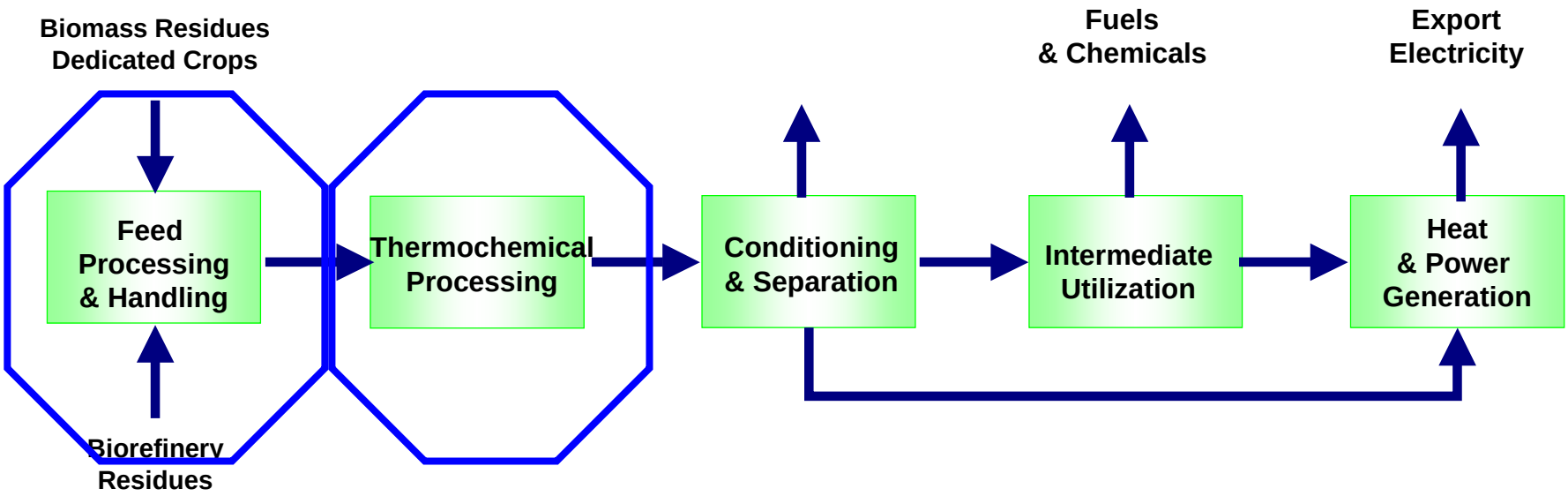

Addressing technical barriers:

- Handling varying lignin-rich feedstocks
- Efficiently converting biomass with low tar production
- Achieving desired syngas composition
- Effective handling/recovery of inorganic material

Cost of SynGas

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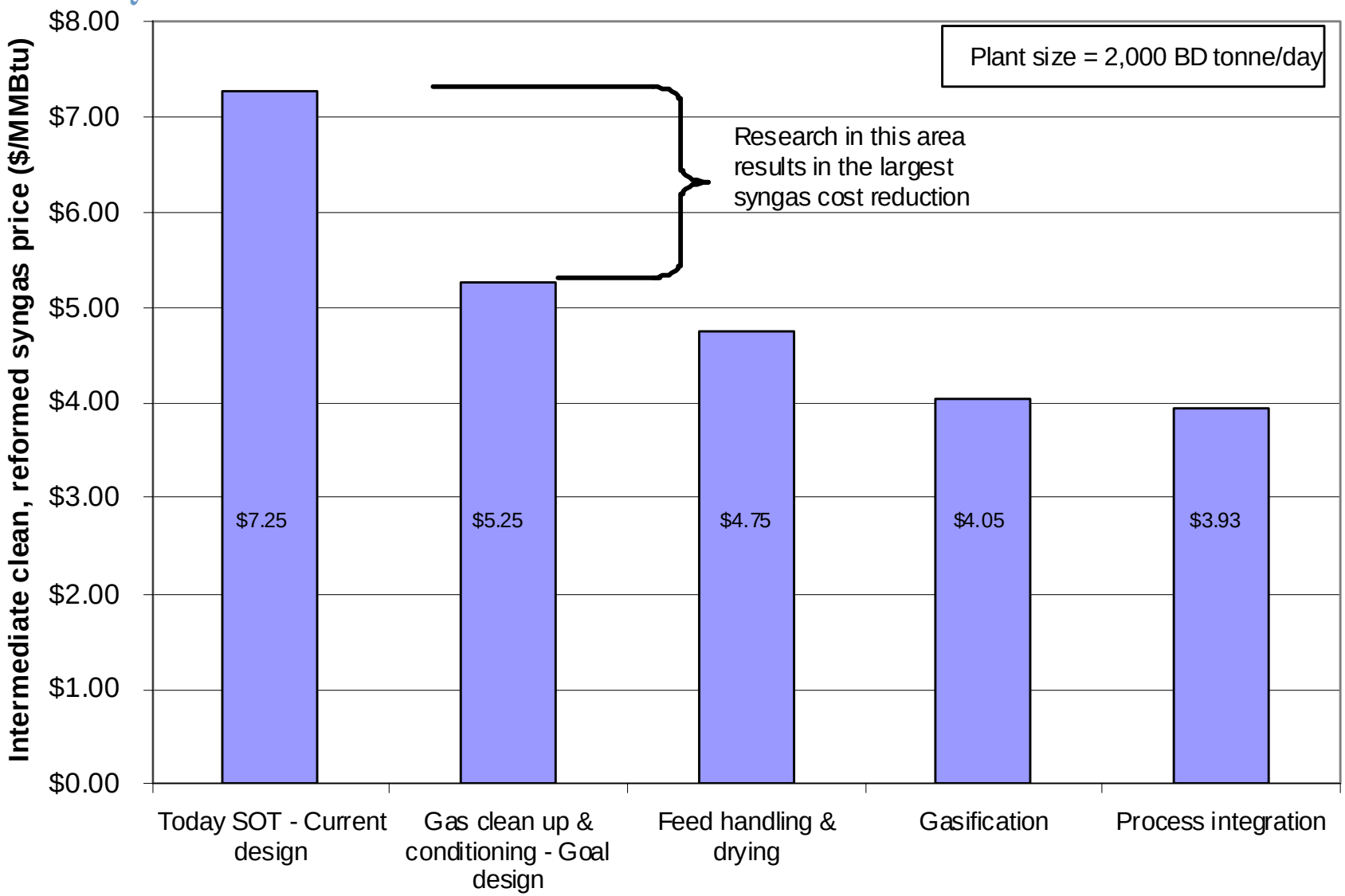

Pathways and Milestones – A & B Level Milestones

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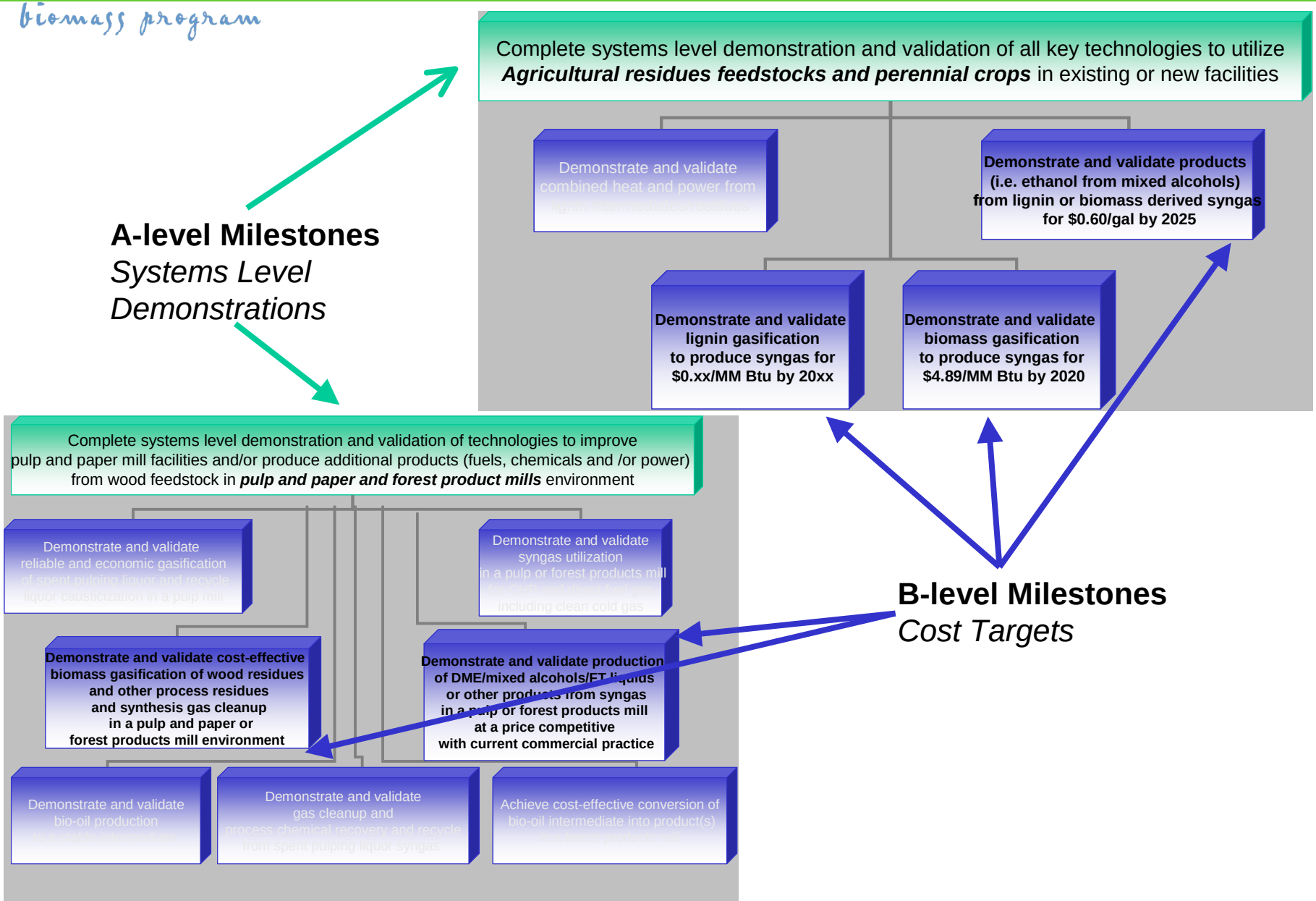

Impact of Thermochemical Platform R&D on A and B Milestones in the Agricultural Residues and Perennial Crops Pathways

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Complete systems level demonstration and validation of all key technologies to utilize ***Agricultural residues feedstocks and perennial crops*** in existing or new facilities

- Demonstrate and validate combined heat and power from lignin intermediates/residues
- Demonstrate and validate products (i.e. ethanol from mixed alcohols) from lignin or biomass derived syngas for $0.60/gal by 2025
- **Demonstrate and validate lignin gasification to produce syngas for $0.xx/MM Btu by 20xx**
- **Demonstrate and validate biomass gasification to produce syngas for $4.89/MM Btu by 2020**

Impact of Thermochemical Platform R&D on A and B Milestones in the Pulp and Paper and Forest Products Pathway

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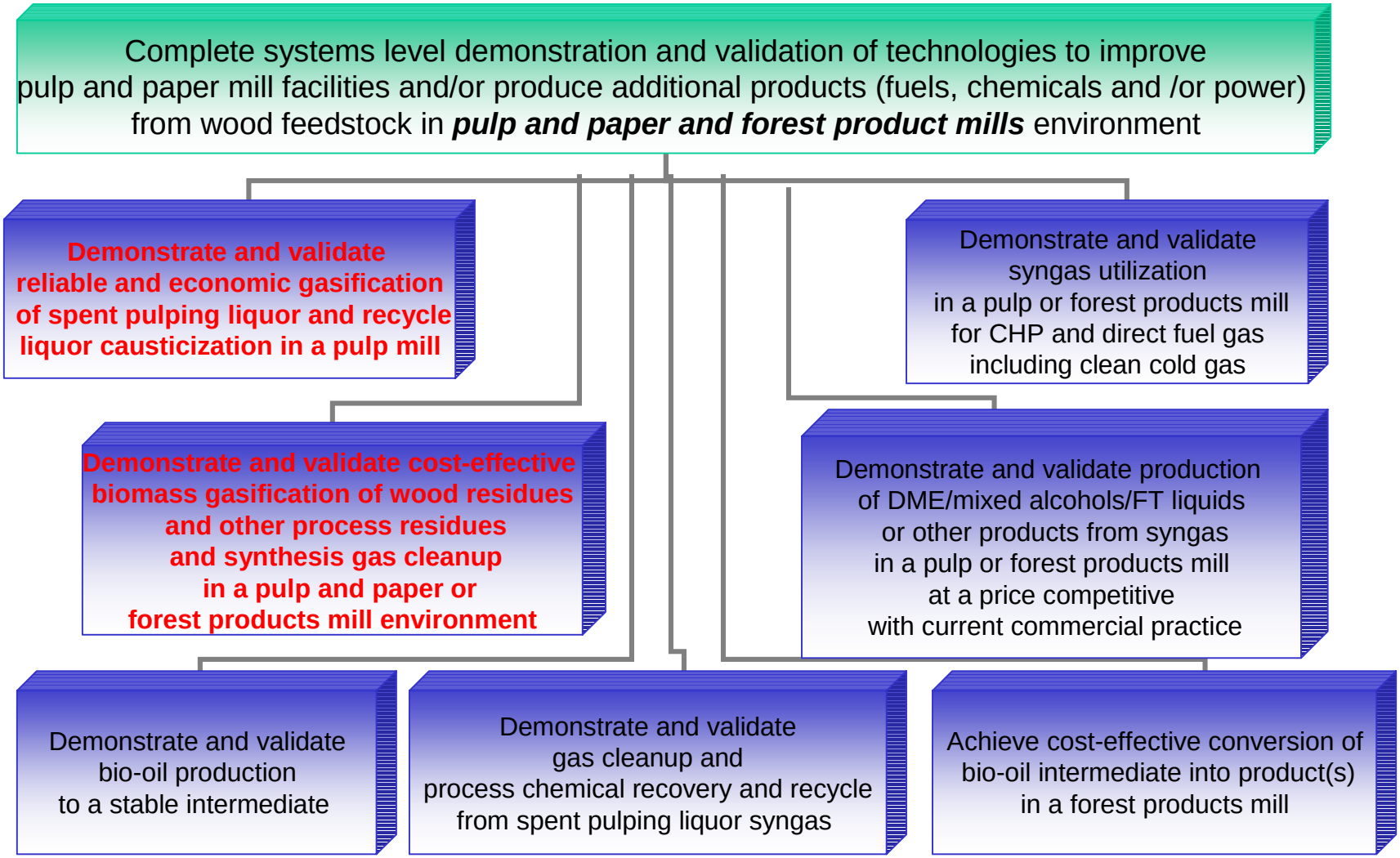

Pathways and Milestones – C-level and Project Milestones

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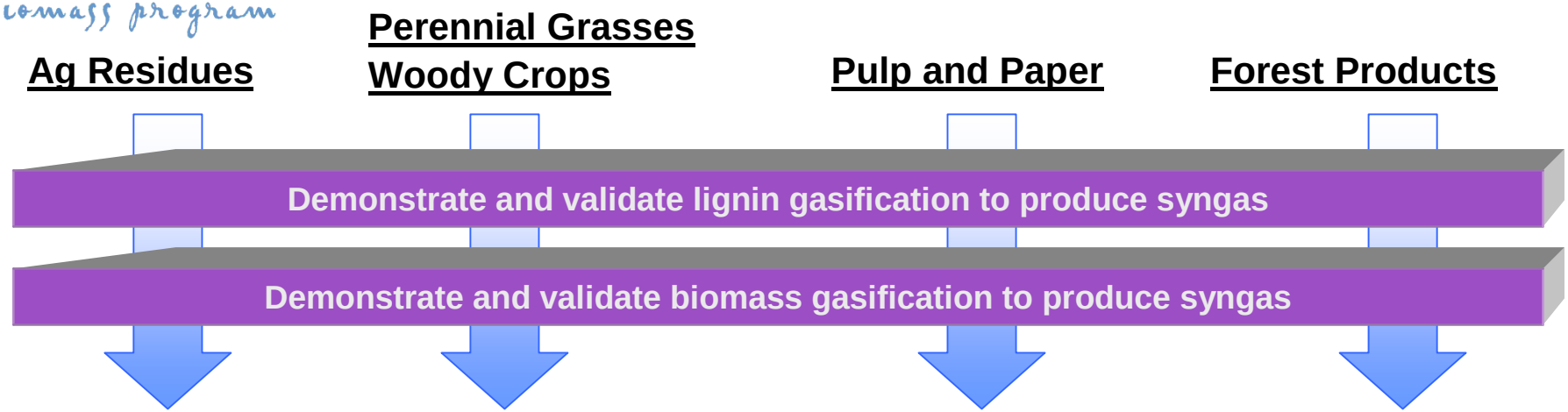

Project Milestones	Type	Performance Expectations	Due Date

Customers

- Customers are the current and future operators of biomass processing facilities, and the partners who provide them with engineering and equipment.

Project Budgets

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Project	FY 04	FY 05	FY 06 Plan
3.1. Feed Processing/ Handling		**400**	300
3.2. TC Processing	**2,725**	**1,667**	1,220
3.3 Cleanup and Conditioning	3,053	4,273	3,470
3.5 TC Analysis	851	750	610
Total Funding	6,629	7,090	5,600